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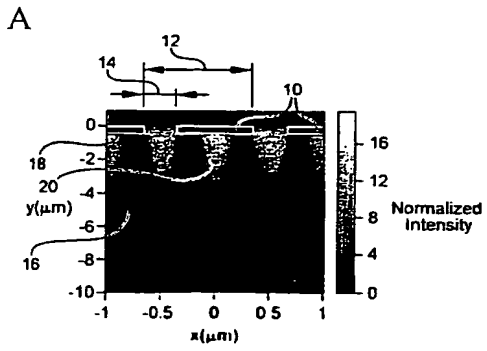
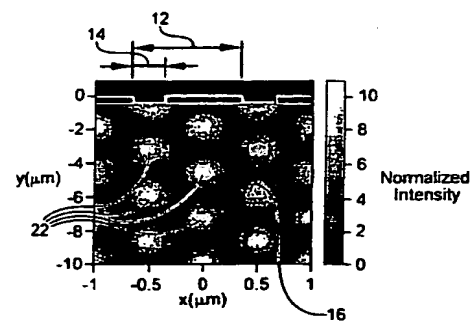
(54) Title: HIGH RESPONSIVITY HIGH BANDWIDTH METAL-SEMICONDUCTOR-METAL OPTOELECTRONIC DEVICE





(57) Abstract: An optical device for sensing an incident optical wave within a wavelength range includes a first array and a second array of electrodes superposed on a substrate, and a sensor connected to the contacts. The arrays are interdigitated. Each array includes its own parameters: contact width, contact thickness, groove width, and a groove dielectric constant. A structure associated with the arrays resonantly couples the incident wave and a local electromagnetic resonance or hybrid mode including at least a surface plasmon cavity mode (CM). For coupling the CM, an aspect ratio of contact thickness to spacing between electrodes is at least 1. A preferred structure for coupling a hybrid mode for high bandwidth and responsivity includes a higher dielectric constant in alternating grooves. The substrate may include silicon, including silicon-on-insulator (SOI). An SOI device having a alternating grooves with a higher dielectric, e.g., silicon oxide, provides .25 A/W and 30 GHz bandwidth.

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